

JACKSON METROPOLITAN AREA, MISSISSIPPI

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

JANUARY 1996

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The responsible lead agency is the U.S. Army Corps of Engineers, Vicksburg District. The responsible cooperating agencies are the U.S. Fish and Wildlife Service; Mississippi Department of Wildlife, Fisheries and Parks; Environmental Protection Agency; and the Pearl River Basin Development District.

Abstract. The Jackson metropolitan study area encompasses the portion of the Pearl River Basin between approximate River Miles 270.0 and 302.0 of the Pearl River. The study area includes parts of Madison, Hinds, and Rankin Counties. Both structural and nonstructural alternatives to reduce urban flood damage were developed. A no action alternative was considered, but it would not meet the need for urban flood control. Nonstructural alternatives were evaluated and were not economically feasible and/or would not meet project flood control objectives. Structural alternatives considered included various plans for clearing the floodway, overbanks, and comprehensive levee plans. The recommended alternative, which is a comprehensive levee plan, consists of 21.9 miles of levee construction, a 3,720-foot-long floodwall, and raising 10.5 miles of existing levee. Floodgates and drainage structures would be located at strategic locations necessary to pass interior runoff. The estimated cost of the plan including mitigation is \$99,379,300 with a favorable benefit-cost ratio of 1.39. To compensate fully for unavoidable losses associated with project implementation, approximately 1,228 acres of marginal agricultural lands would be acquired in fee title and reforested. Compensation would be concurrent with project construction.

If you would like further information on this statement, please write to the following address:

Commander
U.S. Army Engineer District, Vicksburg
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Vicksburg, Mississippi 39180-5191

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JACKSON METROPOLITAN AREA, MISSISSIPPI

DRAFT ENVIRONMENTAL IMPACT STATEMENT

INTRODUCTION

1. The U.S. Army Corps of Engineers, Vicksburg District, has completed studies evaluating alternatives to the authorized Shoccoe Dam project that addresses concerns of the Jackson, Mississippi, metropolitan area relating to flooding of the Pearl River. The recommended plan requires the construction of 21.9 miles of new levees, 3,720 feet of floodwall, and the raising of 10.5 miles of existing levees, along with appurtenant floodgates and pumping plants. The recommended plan is economically justifiable, having a benefit-cost ratio of 1 to 1.39, and appears to satisfy concerns of the local sponsor and a majority of affected citizenry.
2. The draft Environmental Impact Statement (EIS) is an analytical, self-supporting document that informs decision makers and the public. It defines current environmental issues, evaluates flood control impacts for an array of alternatives, and addresses mitigation concurrently with project construction. This document also evaluates the impacts associated with implementation of the compensation plan.

MAJOR CONCLUSIONS

3. The Jackson metropolitan area has major flooding problems with annual flood damages averaging approximately \$12 million. The majority of these damages occur to residential development. The recommended alternative, which is a comprehensive levee plan, consists of 21.9 miles of levee construction, a 3,720-foot-long floodwall, and raising 10.5 miles of existing levee. Floodgates and drainage structures would be located at strategic locations necessary to pass interior runoff. The recommended plan reduces potential floods to this urban area, avoids and minimizes adverse impacts through project design features, and compensates for unavoidable adverse impacts to fish and wildlife resources.
4. Alternatives considered, but eliminated during this study, included no action, plans consisting solely of nonstructural measures, and various clearing plans. A range of levee heights were evaluated in detail using new risk analysis procedures. It is not practical to present impacts in the document for each levee height considered. For display purposes, the plans corresponding to 44.8, 47.0, and 48.8 feet at the Jackson gage are presented. These are identified as Plans A, B, and C, respectively.

AREAS OF CONTROVERSY

5. There were no major areas of controversy during the course of this study.

UNRESOLVED ISSUES

6. No major unresolved issues currently exist regarding the proposed project.

RELATIONSHIP TO ENVIRONMENTAL PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS

7. The relationship of each alternative to the requirements of environmental laws, executive orders, memorandums, land use plans and permits was evaluated (Table EIS-1). The Clean Water Act, Executive Order on Flood Plain Management, Executive Order on Wetlands, and requirements for hazardous, toxic, and radiological wastes are of particular importance.

CLEAN WATER ACT

8. The Section 404(b)(1) evaluation concluded that the proposed deposition of fill material associated with project construction is in compliance with guideline requirements established by the Environmental Protection Agency (EPA) (reference Appendix C). A Section 401 Water Quality Certificate must be obtained from the State of Mississippi prior to project construction.

EXECUTIVE ORDER ON FLOOD PLAIN MANAGEMENT

9. Executive Order 11988 directs Federal agencies to reduce flood loss risk; minimize impacts on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by flood plains. Agencies must consider alternatives to avoid adverse effects and incompatible development in the flood plain. If the only practical alternative requires action in the flood plain, agencies must design or modify their action to minimize adverse impacts.

10. Plan formulation included structural, nonstructural, and no-action alternatives. There was no alternative for location of project works outside the flood plain. All structural alternatives would adversely impact the natural environment. Where possible, levee alignments were designed to avoid ecologically sensitive areas.

11. Flood protection would not induce structural development within the flood plain. Since levee alignments were placed as close to existing development as possible, storage areas for interior runoff during flood events would need to be protected from development for the levee system to function properly. To ensure that this area remains free of induced development, a combination of perpetual easements and local zoning restrictions through the use of flood plain ordinances would be required.

EXECUTIVE ORDER ON WETLANDS

12. Executive Order 11990 directs Federal agencies to avoid, to the extent possible, long- and short-term adverse impacts associated with destruction or modification of wetlands and to avoid direct or indirect support of new

TABLE EIS-1
ENVIRONMENTAL PROTECTION STATUTES AND REQUIREMENTS

Item	Alternative Compliance		
	A	B	C
<u>Federal Statutes</u>			
Archeological and Historic Preservation Act, as amended, 16 U.S.C. 469, et seq.	Partial <u>a/</u>	Partial	Partial
Clean Air Act, as amended, 42 U.S.C. 7401, et seq.	Partial <u>b/</u>	Partial	Partial
Clean Water Act, as amended (Federal Water Pollution Control Act), 33 U.S.C. 1251, et seq.	Partial <u>c/</u>	Partial	Partial
Coastal Zone Management Act, as amended, 16 U.S.C. 1451, et seq.	N/A	N/A	N/A
Endangered Species Act, as amended, 16 U.S.C. 1531, et seq.	Full	Full	Full
Estuary Protection Act, 16 U.S.C. 1221, et seq.	N/A	N/A	N/A
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(2), et seq.	Full	Full	Full
Fish and Wildlife Coordination Act, as amended, U.S.C. 661, et seq.	Full	Full	Full
Land and Water Conservation Act, as amended, 16 U.S.C. 4601, et seq.	N/A	N/A	N/A
Marine Protection, Research and Sanctuaries Act, 22 U.S.C. 1401, et seq.	N/A	N/A	N/A
National Historic Preservation Act, as amended, 16 U.S.C. 4321, et seq.	Partial <u>d/</u>	Partial	Partial
National Environmental Policy Act, as amended, 42 U.S.C. 4321, et seq.	Partial <u>e/</u>	Partial	Partial
Rivers and Harbors Act, 33 U.S.C. 401, et seq.	Full	Full	Full
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	N/A	N/A	N/A
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, et seq.	N/A	N/A	N/A
Farmland Protection Policy Act	Full	Full	Full
<u>Executive Orders, Memorandums, etc.</u>			
Flood Plain Management (E.O. 11988)	Full	Full	Full
Protection of Wetlands (E.O. 11990)	Full	Full	Full
Environmental Effects Abroad of Major Federal Actions (E.O. 12114)	N/A	N/A	N/A
Federal Actions (E.O. 12114)	N/A	N/A	N/A
<u>State and Local Quality Standards</u>			
Mississippi Water Quality Standards	Full	Full	Full
<u>Land Use Plans</u>	N/A	N/A	N/A

TABLE EIS-1 (Cont)

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- Notes: The compliance categories used in this table were assigned on the following definitions:
- a. Full Compliance. All requirements of the statute, executive order, or other policy and related regulations have been met for this stage of planning.
 - b. Partial Compliance. Some requirements of the statute, executive order, or other policy and related regulations remain to be met for this stage of planning.
 - c. Noncompliance. None of the requirements have been met for this stage of planning.
 - d. Not Applicable. Statute, executive order, or other policy not applicable.
- a/ Full compliance will be established when Section 110 process is completed and coordinated with State Historic Preservation Office.
 - b/ Full compliance will be established when the EIS is coordinated with the Environmental Protection Agency.
 - c/ Full compliance will be established when Water Quality Certification is obtained from the State of Mississippi.
 - d/ Full compliance will be established when Section 106 process is completed and coordinated with the State Historic Preservation office.
 - e/ Full compliance will be established when the Final EIS is filed with the Environmental Protection Agency.

construction in wetlands if a practical alternative exists. Furthermore, agencies shall consider the action's effect on (a) public health, safety, and welfare, (b) maintenance of natural systems, including conservation and long-term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, timber, and food and fiber resources, and (c) other wetland uses.

13. The proposed levees and borrow areas were located to minimize the impacts to bottom-land hardwoods and wetlands. Levee alignments were developed to leave as much acreage as possible on the riverside while providing for adequate storage of interior runoff. Where unavoidable adverse wetlands impacts are predicted, the recommended plan includes compensation measures to be implemented concurrently with project construction that result in no net loss of the local wetland base functional values.

HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTES

14. Army Regulation 200-1, April 1990, and memorandum, ENVR-EH, 1 November 1990, subject: Real Property Transactions and Preliminary Assessment Screening (PAS), require a PAS for all real property transactions where the property is within the United States and involves a non-Army party.

15. A PAS determines whether hazardous, toxic, and radiological wastes (HTRW) were stored, released, or disposed of on site. The PAS develops sufficient information to (a) adequately assess health and safety risks, (b) define the nature, magnitude, and extent of any environmental contamination, and (c) identify potential liabilities of the real property transaction.

16. During 1992, an aerial survey was conducted to identify hazardous/ toxic waste dump sites which may impact levee construction. Eighteen potential sites were identified. Subsequent onsite investigations of the 18 areas revealed four sites that should be considered in developing the final alignment. A discussion of these sites is contained in paragraph 25 of Appendix 4. Based on the proximity of these sites to the proposed levee alignment, the potential for impacting this project is low. A review of records/files of the Mississippi Department of Environmental Quality did not reveal any hazardous sites within the search area.

NEED FOR AND OBJECTIVES OF ACTION

17. Congress, the Corps, and the Pearl River Basin Development District (PRBDD) are responding to the need for urban flood protection.

AUTHORITY AND DIRECTION

18. Studies of the Jackson Metropolitan Area, Mississippi, were authorized by congressional resolutions adopted 9 May 1979. These authorizations read as follows:

"Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Pearl River Basin, Mississippi and Louisiana, published as House Document Number 282, Ninety-Second Congress, Second Session, and other pertinent reports, with a particular view toward determining whether any further improvements for flood damage prevention and related purposes are advisable at this time. The alternatives are to be reviewed with local interests to insure a viable, locally supported project.

Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors is hereby requested to review the report of the Chief of Engineers on the Pearl River and Tributaries, Mississippi, contained in House Document 441, 86th Congress, and other reports with a view to determining whether measures for prevention of flood damages and related purposes are advisable at this time, in Rankin County, Mississippi.

Resolved by the Committee on Environment and Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, and is hereby requested to review the reports of the Chief of Engineers on Pearl River Basin, Mississippi and Louisiana submitted in House Document Numbered 92-282, 92nd Congress, 2nd Session and other pertinent reports with a view to determining whether any further improvements for flood damage prevention and related purposes are warranted at this time."

Public Concerns

19. The record flood of April 1979 at Jackson produced strong sentiments regarding the need for flood control measures at the earliest possible date. This public concern resulted in the proposed Shoccoe Dam alternative to provide flood protection for the area. While authorized, this alternative was never implemented. A scoping meeting was held in March 1992 at Jackson, Mississippi, during which concern was expressed for obtaining relief from flooding and for preserving and enhancing environmental quality. Interest was also expressed in the use of Ross Barnett Dam, a non-Federal project on the Pearl River above Jackson, for flood control.

PLANNING OBJECTIVES

20. The objective of this study was to identify alternatives to reduce present and future economic losses from overbank flooding along the Pearl River in the Jackson metropolitan area. Additionally, the environmental goal was to ensure no net loss of environmental resources associated with project

construction and operation by compensating 100 percent for unavoidable adverse environmental impacts, concurrent with project implementation. This applies specifically to wetland habitat, aquatic habitat, terrestrial habitat, waterfowl habitat, and cultural resources.

ALTERNATIVES

PRELIMINARY SCREENING

Preliminary Screening

21. An extensive array of studies of flooding problems in the Pearl River Basin has been accomplished by the Corps and others. A feasible solution to reducing flood damages in the Jackson metropolitan area was developed by the Corps in the mid-1980's (Shoccoe Dam), but could not be implemented because of public opposition. A Corps reconnaissance study, which was completed in 1990, evaluated other alternatives to determine their feasibility. That study determined that at least one comprehensive levee plan would protect against major floods and was economically justified. In a 26 March 1992 scoping meeting held in Jackson, Mississippi, the affected public assisted in identifying significant issues related to proposed project action. An itemization of issues identified in the scoping meeting is presented in the Public Involvement section of this EIS.

No Action

22. The Jackson area is expected to continue its rapid urban growth. Along with an increase in population, will be an increased need for additional housing, services, recreational areas, and other factors important to growth. With increased development, the damage potential due to flooding of the Pearl River will increase. With no additional protection from flood damages, floods similar to those which occurred in the springs of 1979 and 1983 could again cause widespread damage.

Nonstructural

23. One nonstructural alternative was evaluated during previous studies by the Mobile District. This plan consisted of relocation of occupants and/or structures from the 10-year flood plain. This plan alone would directly benefit only a few families and businesses and does relatively little to solve the flood problem at Jackson. This plan was not economically justified.

24. Nonstructural measures, in addition to floodproofing buildings and relocating occupants from the flood plain, include flood warning systems and emergency evacuation. An enhanced flood warning (Forecasting) system is operated by the Jackson-Hinds Emergency Operations Center. Flood warnings are issued by the National Weather Service. Local governments are responsible for evacuation. In Jackson, the Police Department is the lead agency in evacuation efforts. In the other municipalities, emergency procedures are handled by the mayors' offices. Flood plain management ordinances in all the communities in the Jackson area meet Federal standards.

Structural

25. Several types of flood damage reduction measures were considered by the Mobile District in the Pearl River Basin Interim Report on Flood Control (July 1985). These included multipurpose reservoirs upstream from Jackson, comprehensive channel modification, a river bend cutoff, various levee alternatives, and a ditch to divert water from the Pearl River to the Big Black River. This report recommended the National Economic Development (NED) plan which consisted of a dry dam impoundment in the vicinity of Shoccoe, Mississippi. Other measures are discussed in the following paragraphs.

Clearing in Floodway

26. Numerous plans consisting of clearing of the overbanks along the Pearl River through Jackson were evaluated by the Mobile District during the interim flood control study. These plans varied from 2.2 miles in length encompassing 244 acres up to 23 miles in length encompassing 4,790 acres. Plans consisted of total and selective clearing of the overbank. Four clearing plans were carried into the final array of alternatives. Of these, Plan 1G was retained for detailed evaluation along with Shoccoe Dam.

Levees

27. Several levee plans were evaluated by the Mobile District as a part of the Pearl River interim report. These included raising the existing levees and additional levees for the areas of northeast Jackson, Prairie Branch, Eubanks Creek, Belhaven Creek, Town Creek, South Jackson, Richland, Caney Creek, and Byram. All of these levees were evaluated separately and not as a comprehensive levee system. Costs for these plans included extensive channelization of the Pearl River to offset the induced flood damage resulting from increased river stages. None of the plans were found to have economic justification except for the northeast Jackson levee plan which approached economic feasibility.

Comprehensive Levee Plans

28. In light of the plans previously evaluated, current study efforts concentrated primarily on a comprehensive levee plan. A plan was developed with alignments that would provide protection to all existing development, where engineeringly practicable, from a design flood equivalent to the 1979 Easter-time flood. The design flood was evaluated assuming no regulation of storage with Ross Barnett Reservoir, since the reservoir has limited flood storage capacity. Additionally, levels of protection equivalent to 100-year and 500-year flood frequency were evaluated.

29. Floodgates and pumping plants were located at strategic locations necessary to pass interior runoff. Pumps were included in addition to floodgates at those locations where stage frequency of interior ponding at the lowest damage elevation exceeded 1 in 100 years. However, none of the pumping plants were economically justified.

30. During the reconnaissance, a variation of the levee plan was developed. This plan did not include levees for Byram, Richland, or extreme south Jackson. Due to the local sponsor's assurance that the second levee alternative would not be politically acceptable to the concerned municipalities, this plan was not considered implementable. During the current feasibility study, the Byram segment was eliminated from further consideration since damages in that area were not of the magnitude to justify a levee.

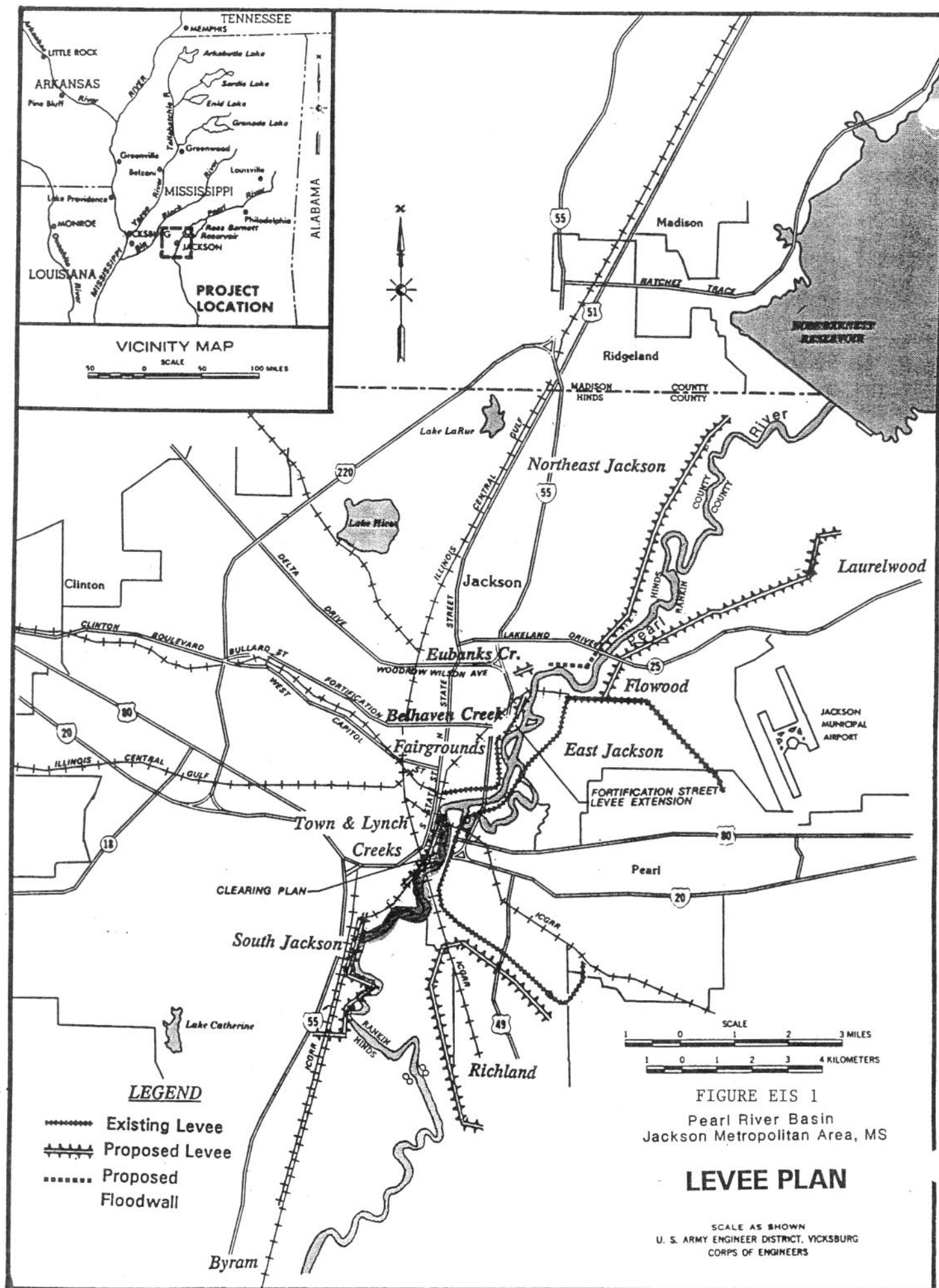
Description of Levees

31. All levee alternatives consists of both constructing new levees, floodwalls, and raising existing levees. Two alternative borrow locations, opposite, and satellite were evaluated for each levee alternative. Figure EIS-1 shows the project vicinity and general location of the levee alignment. Physical features of the levee plans are presented in Table EIS-2. Plans A-1 and A-2 represent a 100-year levee with opposite and satellite borrow, respectively. Plans B-1 and B-2 represent a levee height comparable to the 1979 flood plus 3 feet, and Plans C-1 and C-2 represent a 500-year levee.

TABLE EIS-2
PHYSICAL FEATURES OF LEVEE ALTERNATIVES

Plan	Levee Embankment (cubic yards)	Borrow Area (acres)	Slurry Trench (feet)	Total Right-of-Way (acres)	Mitigation (acres)
A-1	4,319,000	477	29,100	1,289	1,001
A-2	4,319,000	350	29,100	1,016	694
B-1	6,768,000	717	51,600	1,615	1,212
B-2	6,768,000	561	51,600	1,236	901
C-1	7,529,000	783	51,600	1,700	1,283
C-2	7,529,000	641	51,600	1,378	977

32. Approximately 242 acres of clearing in the floodway would be required between River Mile (RM) 290.5 and 301.5. This is necessary to offset the increase in stage between the levees and minimize the impact this increase might have on releases from the Ross Barnett Reservoir. The clearing would consist of removal of the vegetation for 100 feet on either side of top bank, from the dam downstream to the low water weir at the water treatment plant, and for a 400-foot width across bendways upstream of Lakeland Drive.



33. Acquisition of approximately 28 businesses along Lakeland Drive would be necessary because of the increase in stages between the levees. Due to the proximity of the businesses on Lakeland Drive to the channel, construction of a levee or floodwall was not engineeringly feasible.

Flood Plain Clearing

34. Removal of flood plain vegetation to improve the hydraulic efficiency of overbank floodflows was determined to have merit in reducing flood damage. During coordination with local interests, a desire was expressed to include a plan that might provide a somewhat lower level of protection at a reduced cost. Particular interest was shown regarding continuation of the existing overbank clearing. As a result, the four clearing plans (1G), (1F), (5), and (5A) evaluated in detail by the Mobile District were reevaluated. These are identified in this report as Plans D-1, D-2, E-1, and E-2, respectively. Table EIS-3 summarizes the major features of these four alternatives which are illustrated in Figures EIS-2 through EIS-5.

TABLE EIS-3
PHYSICAL FEATURES OF CLEARING PLANS

Plan	Total Clearing (acres)	Selective Clearing (acres)	Stone Bank Protection (tons)	Mitigation (acres)
D-1	1,402	--	--	1,317
D-2	--	1,247	--	511
E-1	2,562	--	11,000	2,408
E-2	--	2,225	11,000	987

Total Clearing Plans

35. Two plans (D-1 and E-1) were evaluated which called for total clearing of the flood plain vegetation. Plan D-1 consisted of clearing from RM 278.83 to 285.3 (6.47 miles). Plan E-1 consisted of clearing from RM 287.55 to 292.63 (5.08 miles) in addition to the area cleared in Plan D-1. Total clearing would include the removal of all trees and vegetation and burning of the debris within the existing cleared maintenance strip.

Partial Clearing Plans

36. Due to the magnitude and quality of the fish and wildlife habitat affected by total clearing, alternative Plans D-2 and E-2 were evaluated. These alternatives incorporated varying degrees of selective clearing comprised primarily of two components: selected species and diameter-at-breast-height (DBH) selection. Selected species removal would ensure that stand diversity will be maintained, although stand density would be reduced to no more than 80 trees per acre. For DBH selection, only those trees greater than 18 inches DBH would be left.

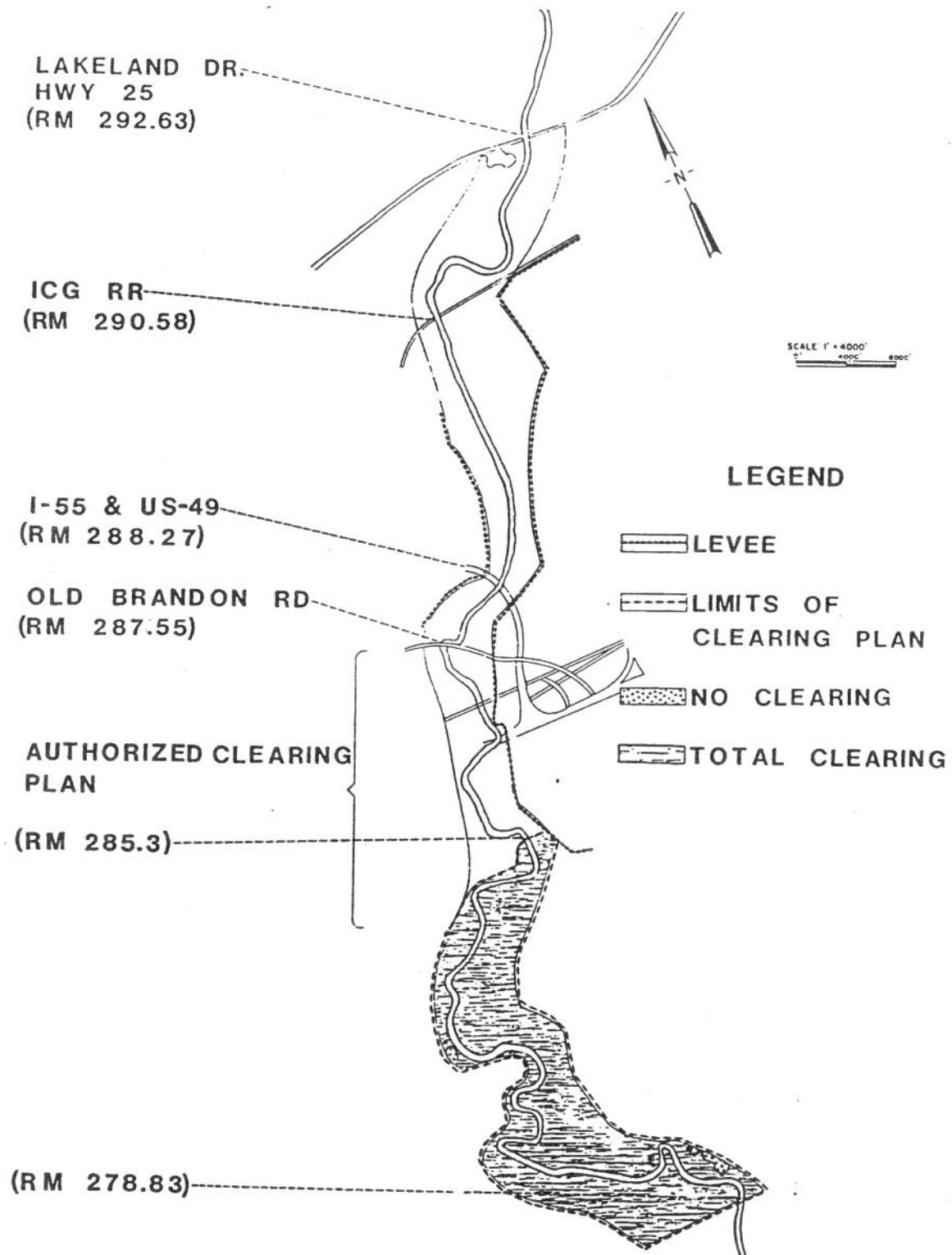


FIGURE EIS-2
PRELIMINARY SCREENING ALTERNATIVE
PLAN D-1
FOR
JACKSON METROPOLITAN AREA,
MISSISSIPPI

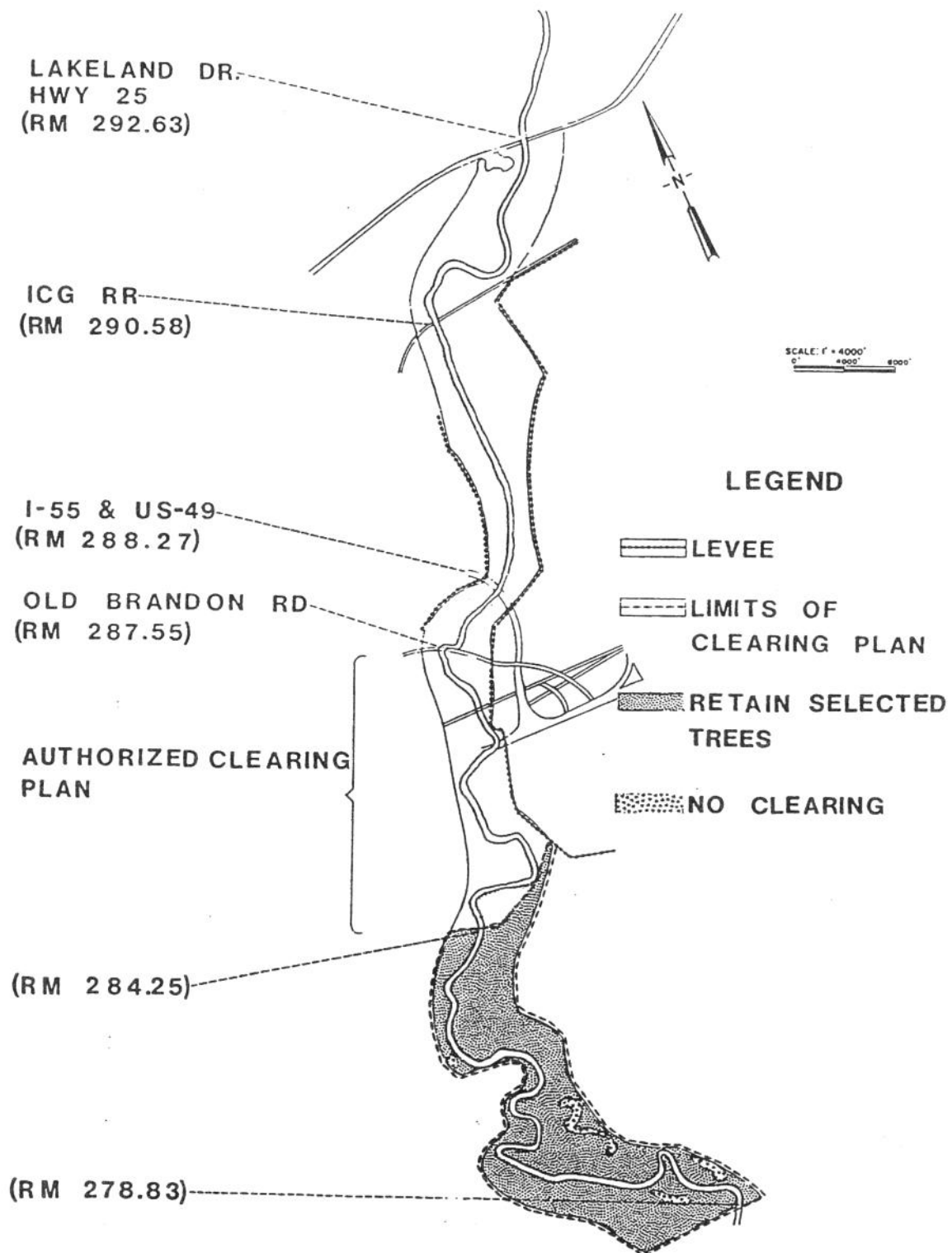


FIGURE EIS-3
PRELIMINARY SCREENING ALTERNATIVE
PLAN D-2
FOR
JACKSON METROPOLITAN AREA,
MISSISSIPPI

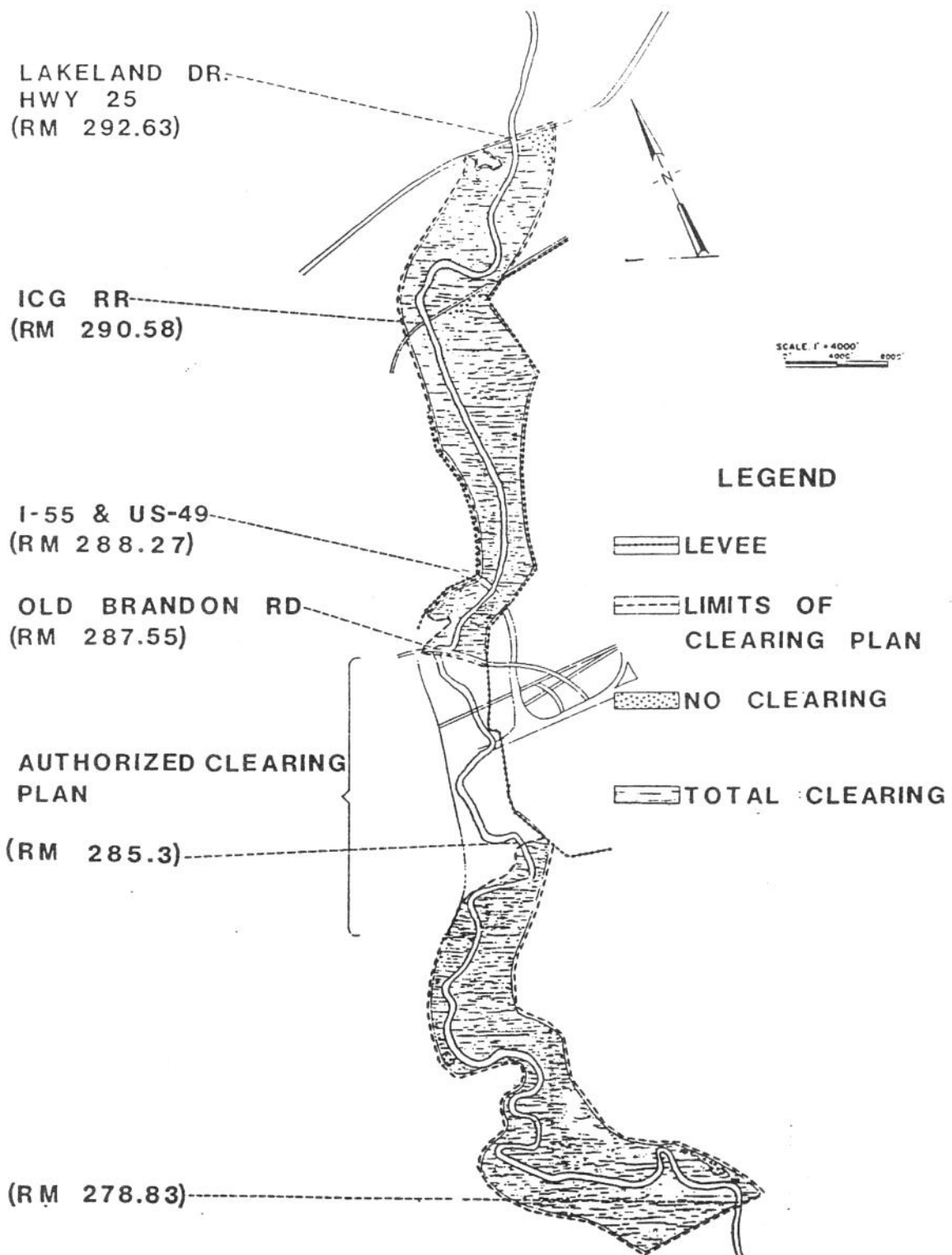


FIGURE EIS-4
PRELIMINARY SCREENING ALTERNATIVE
PLAN E-1
FOR
JACKSON METROPOLITAN AREA,
MISSISSIPPI

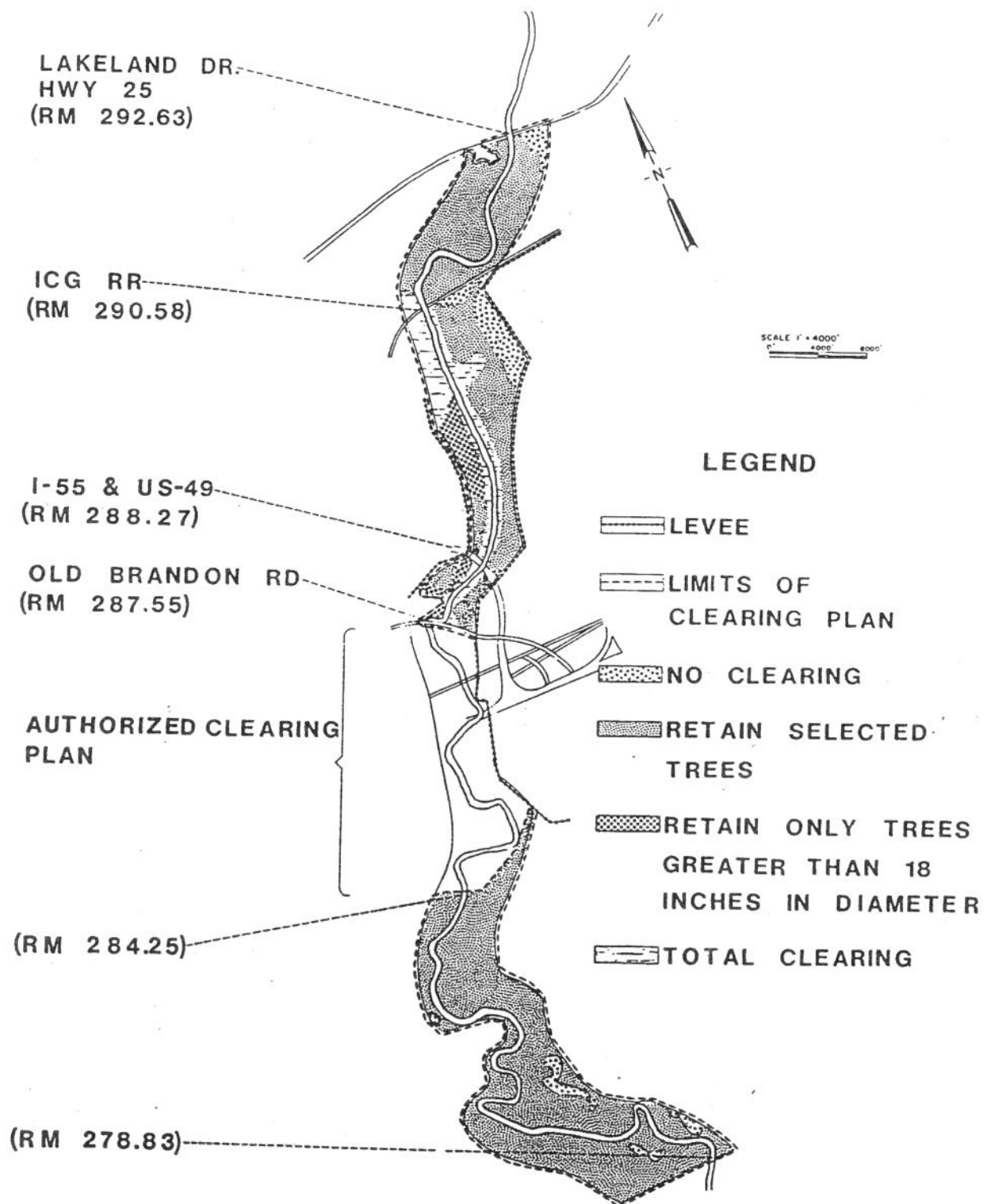


FIGURE EIS-5
PRELIMINARY SCREENING ALTERNATIVE
PLAN E-2
FOR
JACKSON METROPOLITAN AREA,
MISSISSIPPI

37. Selective clearing would be performed by identifying all trees which would not be cut, and cutting flush with the ground all trees greater than 6 inches DBH which would not remain. Trees and undergrowth less than 6 inches DBH would be removed by mechanical means. Precautions would be taken not to damage trees which are to remain when removing smaller trees and undergrowth. To assure conveyance of floodflows through the selectively cleared areas, all remaining trees would be trimmed of branches to 15 feet above the existing ground.

38. In areas proposed to be totally cleared, annual mowing would be required to maintain the hydraulic efficiency of the cleared floodway. Selectively cleared areas would require mowing four times per year to prevent the loss of hydraulic efficiency.

SCREENING OF ALTERNATIVE PLANS

39. Table EIS-4 presents a cost summary for the various levee and clearing plans. Based on an analysis of cost, benefits, and mitigation requirements, total satellite or offsite borrow was eliminated from further consideration. Table EIS-5 presents the summary of first cost, annual costs, annual benefits, excess benefits over cost, and the benefit-cost ratio for alternative Plans A-1, B-1, C-1, D-1, D-2, E-1, and E-3. As mentioned previously, the costs for Plans A-1, B-1, and C-1 were used to develop a cost curve to evaluate a full array of levee heights based on the risk analysis procedures. The economic data for the levee plans in Table EIS-5 are based on this risk analysis. They are shown here only for comparison purposes with the clearing plans. As can be seen from Table EIS-5, only one of the clearing plans was economically justified and that plan was only marginal. As a result, all clearing plans were eliminated from consideration. A detail discussion of the risk analysis for the levee plans is contained in Appendix 6.

TABLE EIS-4
FIRST COST OF ALTERNATIVE PLANS
(\$000)

Plan	Real Estate	Construction	Mitigation	Total First Cost
A-1	21,861	44,600	1,633	68,094
A-2	20,734	49,707	1,177	71,618
B-1	22,981	53,367	1,962	78,310
B-2	21,437	60,845	1,563	83,845
C-1	23,916	56,810	2,049	82,775
C-2	22,476	65,081	1,654	89,211
D-1	1,524	4,395	2,068	7,987
D-2	799	3,195	969	4,963
E-1	2,850	8,687	3,584	15,121
E-2	1,895	6,786	1,665	10,346

TABLE EIS-5
SUMMARY OF ECONOMIC ANALYSIS ^{a/}

Plan	First Cost (\$000)	Annual Cost (\$000)	Annual Benefits (\$000)	Excess Benefits (\$000)	Benefit-Cost Ratio (%)
A-1	68,094	7,505	11,723	4,218	1.6
B-1	78,310	8,604	12,871	4,267	1.5
C-1	82,775	9,053	13,315	4,262	1.5
D-1	7,987	1,136	1,218	82	1.1
D-2	4,963	785	445	(340)	0.6
E-1	15,111	2,053	1,684	(369)	0.8
E-2	10,346	1,549	829	(720)	0.5

NOTE: Numbers in parenthesis represent negative benefits.

^{a/} Based on May 1993 price levels, 7-3/4 percent discount rate.

PRIOR CONSTRUCTION

Existing Levees

40. The Jackson (Fairgrounds) and East Jackson levees were completed in 1968 by the Corps. These protective works consist of two earthen levees, four gated outlets, and two pumping stations. Some 5.34 miles of river channel work was involved in constructing the plan. The Jackson levee protects 420 acres in the fairgrounds area of Jackson on the west side of the river. The longer, East Jackson levee protects 5,870 acres, including the town of Pearl and portions of Flowood and Richland. This project was sponsored by the Rankin-Hinds Pearl River Flood and Drainage Control District, which presently operates and maintains the levees. Maintenance, in addition to maintaining the levee structures, involves periodic removal of vegetation along a 650-foot-wide cleared strip between the levees. In 1984, an extension on the north end of the Jackson levee was constructed to eliminate flanking of the levee, such as occurred during the record flood of April 1979. This extension is approximately 0.2 mile long and protects an additional 380 acres.

41. The Jackson levee top grade was set based on protecting against a 100-year floodflow of 103,000 cubic feet per second (cfs) with 3 feet of freeboard. Subsequent hydrology studies raised the computed 100-year peak floodflow at Jackson to 111,000 cfs. In view of the increase of the flow for the 100-year flood event, a study was made to determine the adequacy of the levee protection under present conditions. It was found that the new work accomplished in the floodway since 1968 has lowered the elevation of the 100-year flood stage. The levees now provide protection from the revised 100-year flood (111,000 cfs) with about 2.5 feet of freeboard.

Floodway Clearing

42. The clearing plan which was completed in 1984 extended from about 0.5 mile below the Jackson sanitary landfill to Woodrow Wilson Bridge, a total of 3.3 river miles. The plan consisted of 237 acres of complete clearing, 20 acres of selective clearing, and 89 acres of partial clearing. Approximately 39,000 tons of riprap were required for protection around bridges. Location of the clearing plan is shown on Plate 1. To offset unavoidable impacts to fish and wildlife associated with the clearing plan, approximately 320 acres of bottom-land hardwoods in the lower Pearl River Basin were acquired as mitigation.

Excavation at Highway 25 Bridge

43. The modification at Highway 25 bridge consisted of removing material from the west bank of the Pearl River approximately 600 feet upstream and downstream of the bridge to increase the conveyance of the stream at that location. This work was completed by PRBDD in 1983. The location of this work is shown on Plate 1.

Richland Creek Watershed

44. A Soil Conservation Service (SCS) flood control project was authorized for the Richland Creek Watershed under Public Law 83-566. The project included land treatment measures, three floodwater-retarding structures, and 17.6 miles of channel work. Benefits of the project accrued to rural properties, crops, pasture, and urban properties within the city of Richland. Local sponsors were the Richland Creek Watershed Drainage District and Rankin County Soil and Water Conservation District.

Ross Barnett Reservoir

45. The Ross Barnett Reservoir was constructed by the Pearl River Valley Water Supply District, a state-chartered organization, between 1960 and 1962 for purposes of water supply and recreation. The dam and reservoir location are shown on Plate 1. The earthfill dam is 23,400 feet in length with a maximum height of 64 feet. Elevation at the top of the dam is 308 feet, National Geodetic Vertical Datum (NGVD). The principal spillway consists of ten 40- by 21-foot tainter gates with a discharge capacity of 180,000 cfs. The emergency spillway is a fuse plug type with a discharge capacity of 70,000 cfs.

RECOMMENDED PLAN

46. The recommended levee alignment and plan are displayed on Plates 4-V-1 through 4-V-17 and would require approximately 1,024 wooded and 481 cleared acres of rights-of-way. Table EIS-6 contains rights-of-way requirements,

TABLE EIS-6
RIGHTS-OF-WAY REQUIREMENTS

Levee Segment	Overbank		Levee		Borrow		Total	
	Cleared	Wooded	Cleared	Wooded	Cleared	Wooded	Cleared	Wooded
Northeast Jackson	74 a/	168	13	100	26	205	113	473
Floodwall			7	15			7	15
Eubanks Creek			1	7	3	15	4	22.
Town and Lynch Creeks			18	7	34	14	52	21
South Jackson			17	26	28	44	45	70
Flowood b/			34	74	59	131	93	205
Richland			32	52	41	63	73	115
Belhaven Creek			1	7	3	18	4	25
Fairgrounds			8			14	8	14
East Jackson			66		16	64	82	64
TOTAL							481	1,024

a/ Previously cleared areas across bendways would be maintained.

b/ Includes Laurelwood segment.

which include acreage for levee alignment, borrow material, and floodway clearing. The specific features of this flood control plan are described in the following paragraphs.

NORTHEAST JACKSON

47. This segment includes 25,075 feet of new levee. Floodgates required include a double 60-inch pipe at station 25+30, a double 12- by 12-foot box culvert at station 110+93, a single 12- by 12-foot box culvert at station 147+18, and a double 48-inch pipe at station 235+51. Approximately 13,500 feet of slurry trench would be required. Approximately 4,000 feet of landside ditch would be required at the upstream end of the levee.

LAKELAND DRIVE FLOODWALL

48. This segment includes approximately 3,720 feet of floodwall and about 1,165 feet of levee. A single 36-inch pipe structure would be required at station 291+11. Approximately 3,100 feet of slurry trench would be required.

EUBANKS CREEK

49. This segment includes 1,696 feet of levee with a double 8- by 7-foot box floodgate at station 10+94. Estimated length of slurry trench is 150 feet.

BELHAVEN CREEK

50. This segment includes approximately 1,706 feet of levee. A single 12- by 10-foot box is required at station 9+64. The estimated length of slurry trench is 150 feet.

TOWN AND LYNCH CREEKS

51. This segment includes 7,195 feet of levee. Floodgates required include a triple 12- by 12-foot box at station 16+65 and a triple 12- by 12-foot box at station 65+90. Approximately 2,400 feet of slurry trench would be required along the alignment.

SOUTH JACKSON

52. This segment includes 19,863 feet of levee. An approximately 1,600-foot connecting ditch would be required along the landside toe upstream of Hardy Creek. A double 48-inch pipe would be required at station 37+79 and a double 9- by 9-foot box at station 165+34. Approximately 7,600 feet of slurry trench is required.

LAURELWOOD-FLOWOOD

53. This segment includes about 27,924 feet of levee. Floodgates include a double 48-inch pipe at station 41+57, a single 48-inch pipe at station 92+27, a double 6- by 5-foot box at station 175+03, a double 36-inch pipe at station 197+24, and a double 8- by 6-foot box at station 257+94. Approximately 7,250 feet of slurry trench is required.

RICHLAND

54. This segment includes about 26,434 feet of levee. Approximately 3,200 feet of landside connecting ditch is included at the lower end of the levee. Floodgates required include a single 36-inch pipe at station 31+50 and a double 48-inch pipe at station 152+74.

JACKSON (FAIRGROUNDS)

55. This segment includes raising the existing levee and adding about 2,600 feet of slurry trench.

EAST JACKSON

56. This segment includes raising the existing levee between its juncture with the lower end of the proposed Flowood levee and its end along Richland Creek. A short levee extension is required at the lower end to tie to high ground. Approximately 15,330 feet of slurry trench is required.

GENERAL REQUIREMENTS

57. In addition to the above flood control features, a segment of overbank clearing and relocation of several businesses would be required. The overbank clearing includes a 100-foot strip along top bank of the Pearl River at strategic locations between RM 290.7 and 301.7. Also included is the maintenance of a 400-foot previously cleared strip across four bendways in this reach and the clearing of a 400-foot strip across two additional bendways. Total new clearing is 168 acres with restoration of previous cleared areas totaling 74 acres. Businesses are located between the proposed levees on Lakeland Drive. The relocation of these businesses and acquisition of these properties would be necessary due to an increase in stages at this location.

COMPARATIVE IMPACTS OF ALTERNATIVES

58. All construction alternatives would cause significant adverse impacts to terrestrial resources. Table EIS-7 presents a summary of the expected impacts from considered alternatives. This table also includes the required compensation, if applicable, for each alternative.

TABLE EIS-7
COMPARATIVE IMPACTS OF ALTERNATIVES

Resource	No Action	Alternative A	Alternative B (Recommended)	Alternative C
Terrestrial Habitat	Existing conditions would continue. 31,075 acres of bottom-land hardwoods, 2,113 acres of mixed-pine hardwoods, 1,181 acres of pine, and 1,347 acres of cypress-tupelo.	Net loss of 1,996 AAHU's, 793 acres of bottom-land hardwoods, 54 acres of mixed-pine hardwoods, 30 acres of pine, and 35 acres of cypress-tupelo. Requires 1,001 acres of reforestation/management.	Net loss of 2,503 AAHU's, 891 acres of bottom-land hardwoods, 60 acres of mixed-pine hardwoods, 34 acres of pine, and 39 acres of cypress-tupelo. Requires 1,228 acres of reforestation/management.	Net loss of 2,603 AAHU's, 1,019 acres of bottom-land hardwoods, 69 acres of mixed-pine hardwoods, 39 acres of pine, and 44 acres of cypress-tupelo. Requires 1,283 acres of reforestation/management.
Aquatic Habitat and Fisheries	Existing habitat conditions and land use trends would continue. The Pearl River and its tributaries occurring within the proposed project area would continue to support an important fishery.	Temporary degradation of aquatic habitat with corresponding adverse impact to associated fisheries during construction. Borrow areas would create 502 acres of aquatic habitat.	Temporary degradation of aquatic habitat with corresponding adverse impact to associated fisheries during construction. Borrow areas would create 778 acres of aquatic habitat.	Temporary degradation of aquatic habitat with corresponding adverse impact to associated fisheries during construction. Borrow areas would create 783 acres of aquatic habitat.
Waterfowl Habitat	Overall habitat conditions would remain the same, with some possible reduction due to urban encroachment.	Reduction in forested flood plain would have minor adverse impacts to resident, and to a lesser extent, migratory waterfowl.	Reduction in forested flood plain would have minor adverse impacts to resident, and to a lesser extent, migratory waterfowl.	Reduction in forested flood plain would have minor adverse impacts to resident, and to a lesser extent, migratory waterfowl.
Water Quality	Water quality would remain at current levels.	Increased turbidity and lowered DO levels during construction; no long-term significant impacts.	Increased turbidity and lowered DO levels during construction; no long-term significant impacts.	Increased turbidity and lowered DO levels during construction; no long-term significant impacts.
Ground Water	No impact	No impact expected	No impact expected	No impact expected
Endangered Species	No impact	No impact expected	No impact expected	No impact expected
Air Quality	Air emission and quality would remain at current levels.	Short-term releases of CO, NO, and particulates would be emitted during construction phase; no long-term adverse impacts.	Short-term releases of CO, NO, and particulates would be emitted during construction phase; no long-term adverse impacts.	Short-term releases of CO, NO, and particulates would be emitted during construction phase; no long-term adverse impacts.
Wetlands	Existing wetland habitat having reduced functional value would continue to be lost through encroachment.	Wetland conversion would total approximately 828 acres. Compensated by terrestrial mitigation.	Wetland conversion would total approximately 931 acres. Compensated by terrestrial mitigation.	Wetland conversion would total approximately 1,063 acres. Compensated by terrestrial mitigation.
Cultural Resources	No impact	No impact expected	No impact expected	No impact expected

ENVIRONMENTAL DESIGN AND MEASURES TO MINIMIZE IMPACTS

LEVEE ALIGNMENT

59. Levee alignments were designed to leave as much area as possible on the riverside while providing for adequate storage of interior runoff. In addition, an alternative which would involve construction of a levee through Mayes Lakes State Park was rejected in favor of the floodwall adjacent to the businesses just outside the park. The proposed levee would have interfered with planned expansion of camping facilities, introduced an esthetically unpleasing site to the park setting, and contributed to the further fragmentation of bottom-land hardwood habitat in the basin.

60. Other design measures to minimize impacts included shifts in the west bank levee upstream from Lakeland Drive. Just upstream from Lakeland Drive, the alignment was set closer to existing development to reduce impacts to a cypress-tupelo swamp created by beavers. The area could not be avoided entirely, however, due to the width of the proposed levee and proximity of residences. In the area upstream from Hanging Moss Creek, the alignment was shifted to follow the 16th section line to avoid a significant ecological area at the end of Westbrook Road.

61. During initial levee design, the plan incorporated large berms to prevent underseepage. However, after further study, it became evident that use of slurry trenches was preferred due to less damage to terrestrial habitat and lower maintenance costs. Although some borrow areas would be needed for slurry mixing areas, these could be reclaimed and returned to forested habitat.

BORROW PIT DESIGN

62. Borrow pits (approximately 778 acres) would be designed to minimize clearing at the work site. The number of access points to each pit would also be minimized. In order to reduce direct impacts and provide habitat diversity, several small (5 to 10 acres) separate borrow pits would be utilized instead of one large continuous pit. Following extraction of borrow material, borrow pits would be modified to provide both shallow and deep water areas, with inclusion of peninsulas and/or islands. Trees and brush piles resulting from clearing would be configured to benefit wildlife instead of burning. Some felled trees would be placed perpendicular to the edge of each pit to provide access and loafing areas for certain wildlife species. Access roads and other disturbed areas around borrow pits would be seeded with wildlife food plants such as lespedeza or clover and replanted to hardwood species.

MITIGATION (COMPENSATION) PLAN

63. With the exception of no action, implementation of any of the considered alternative plans would result in unavoidable adverse impacts to terrestrial and wetland resources. These expected adverse impacts would be minimized to the maximum extent possible through environmental design measures. The remaining terrestrial and wetland losses would be compensated 100 percent through acquisition and reforestation of 1,228 acres of marginal farmland. The location and selection of lands will be based on a priority matrix and landowner surveys during the Planning Engineering and Design phase of the project. Mitigation would also include appropriate management improvements.

PROJECT MAINTENANCE

64. Maintenance of the project would consist of mowing the levees, spraying the areas of overbank clearing and landside drainage ditches, with EPA approved herbicides, and routine maintenance at the gravity drainage structures. No spraying, vegetation control, or channel maintenance of any type would be required below top bank of the Pearl River.

AFFECTED ENVIRONMENT

GENERAL DESCRIPTION

65. The Jackson metropolitan study area extends from the Ross Barnett Dam downstream to Byram. The Pearl River Basin in this area contains a diversity and abundance of fish and wildlife resources. The flood plain and main river, along with their associated forested wetlands, tributaries, sloughs, and oxbow lakes, provide habitat for many fish and wildlife species, supporting recreational use.

66. The Pearl River in the Jackson metropolitan area is a narrow, shallow river flowing over a sand, gravel, and mud substrate. The physical geography of the Pearl River is typical of many rivers found in the southeastern United States. The low stream gradient and broad, flat flood plain produces extensive meanders, natural cutoffs, oxbow lakes, overflow channels, old river runs, and an extensively forested flood plain. The flood plain forests consist of highly diverse broad-leaved, deciduous bottom-land hardwoods interspersed with forested wetlands (cypress-tupelo gum associations).

67. Principal tributaries within the study area are Purple/Hanging Moss Creek, Eubanks Creek, Town Creek, Lynch Creek, Three Mile/Hardy Creeks, Caney Creek, Hog Creek, and Squirrel Branch.

68. Soils in the study area are mostly of the Cascilla-Chenneby association or Grenada silt loam. These soils range from poorly to well-drained and are fairly acidic silt loams are found in natural levees and flood plains. Other associations include Bonn-Deerford, Calloway, Oaklimeter, and Reidtown silt loams.

69. Vegetation in the study area is diverse and consists of typical forested wetland and upland tree species associations. Predominant habitat types include bottom-land hardwoods, cypress-tupelo/oxbow associations, pines, mixed pine-hardwoods, pasture/old field, cutover, open water, and urbanized areas.

CLIMATE

70. The climate within the study area is generally mild-subtropical, characterized by high winter and spring rainfalls with dry summers and autumns. The yearly mean temperature is 65 degrees F and the yearly mean high and low temperatures are 77 and 53 degrees F, respectively. Approximately 78 days of the year have temperatures above 90 degrees F and 50 days below 32 degrees F, with a frost-free season averaging 235 days. Relative humidity averages 79 percent and normal annual rainfall is about 57 inches.

HUMAN RESOURCES

71. Data from the 1990 Census show a population of 342,000 in the two-county area, an increase of 6.7 percent since 1980. Significantly, this two-county area contained 13.3 percent of the state's 1990 population. Especially strong growth occurred in Rankin County, with a 58 percent increase from 1970 to 1980 and 26.3 percent from 1980 to 1990. Table EIS-8 displays selected data on the two counties.

TABLE EIS-8
COUNTY POPULATION

County	Population				Percent Change 1980-1990
	1960	1970	1980	1990	
Hinds	187,045	214,973	250,998	254,300	1.3
Rankin	34,322	43,933	69,427	87,700	26.3
Total	221,367	258,933	320,425	342,000	6.7

SOURCE: U.S. Census of Population: 1960, 1970, 1980, and 1990.

72. The parts of the two-county area in and near Jackson are overwhelmingly urban, while the other parts reflect the rural character of the Pearl River Basin. Census data indicate that 78.5 percent of the counties' residents were classified as urban in 1990, but this number is skewed by Hinds County with its 86.6 percent. In both counties, the urban proportions grew significantly